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Lower Memory Prices, New Options, Give VAX Added Power and Versatility

Memory prices cut in half, more memory in the VAX packaged systems, and a new high performance tape transport. These three recent announcements make the VAX-11/780 even more suitable for demanding applications.

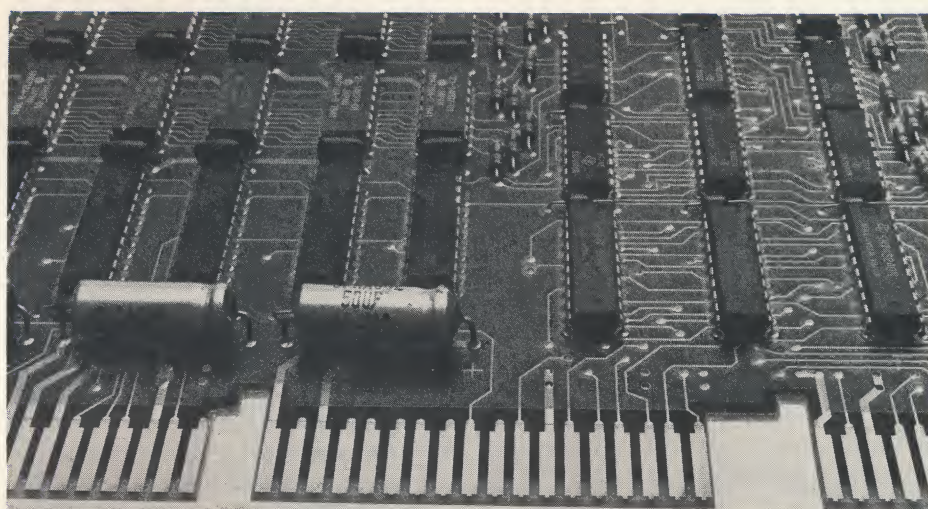
Three other products, IBM 2780/3780 remote job entry support, a shared memory option for multicomputer applications, and two new I/O options, all contribute to the VAX-11/780's growing versatility.

Those were the major product announcements over the summer, but not the only news about VAX. Enthusiastic reports are coming in from early users of the powerful VAX COBOL. Computational and real-time users continue to laud the system, and educators point out its ability to handle their varied computing needs. And everybody praises VAX's program development strengths.

Today there are many hundreds of VAX systems in use around the world, moving into more and more application areas, and in each case illustrating the strength of the VAX design.

The summer's biggest news, though, is that VAX memory prices have been cut in half, due to the economics of 16K memory chips. Adding memory is the quick, efficient way of raising a VAX system's performance in keeping with a growing workload. Now this process is more affordable.

To take advantage of the trend to lower memory prices, and in recognition of the increasingly large applications that customers are running on VAX systems, each



A VAX-11/780 16K chip memory array board.

VAX packaged system now includes more memory. The smallest packaged systems now come with at least 512 Kb of physical memory. These packages and all other VAX systems can be expanded to 8 megabytes.

The new 125 inch per second TU77 tape drive is now standard with the largest VAX configurations. This high performance peripheral, which offers the convenience of autothreading and autoloading, has a level of throughput in keeping with the power of VAX systems.

Communication with an IBM host is made simple with the new 2780/3780 emulator software. This software permits a VAX user to communicate with a remote batch terminal, or any other computer (including a VAX) that supports the 2780/3780 protocols.

A VAX system's physical memory can now exceed 8 megabytes with the addition of the MA780 shared memory unit. This new option

offers up to 2 megabytes of memory that as many as four VAX-11/780s can share. With the MA780, suitably programmed VAX-11/780s can handle very demanding high-throughput or enhanced-availability applications.

Two I/O options, the DW780 UNIBUS Adapter and the DR70-A MASSBUS Interface, can yield higher throughput for customers with specialized I/O needs.

The DW780 lets a VAX system support from one to four UNIBUSes, providing additional medium speed I/O ports. So VAX users can add more devices to their systems and increase overall throughput by distributing high speed and low speed peripherals among different channels.

Finally, another I/O option, the DR70-A MASSBUS Interface, lets VAX users interface a custom I/O device to one of the VAX-11/780's high performance MASSBUSes.

VAX Now Supports 2780/3780 Emulation

The VAX-11 2780/3780 emulator package provides VAX users with a simple means of transferring files across a communication line. The system at the other end can be an IBM System/360 or System/370, an IBM 2780 or 3780 remote batch terminal, a VAX-11/780 system, or another computer system that supports a standard 2780/3780 point-to-point BSC protocol emulator.

IBM's 2780 and 3780 are remote batch terminals designed to communicate with an IBM host system or a variety of IBM communications devices that use BSC protocols. The two terminals are very similar, with the 3780 providing a few more processing options than does the 2780.

The VAX-11 2780/3780 emulator and the 2780/3780 terminals employ the same communications protocol and message formats. However, VAX's emulator package provides many more user options than do 2780 or 3780 terminals.

For example, the emulator user can exercise operator-like control over the file transmission process by coding error-handling logic into a batch program or by entering commands directly from an interactive terminal session.

The emulator provides a shared line mechanism in which requests from multiple users are serialized. It also routes output from the remote system to the appropriate VAX user's directory.

Incoming files arriving from the remote system can be named either individually by the user's application program or can be given a default generic name. The files can be stored on disk and spooled to a printer. The VAX user can easily set the emulator for unattended operation.

The emulator offers three distinct user interfaces, governing files, records, and the device driver. All three interfaces may be in use simultaneously on different lines by different applications. The emulator supports a multiuser,

multiline communications environment in which the processing on each line is independent of the processing on other lines.

Files being sent to the remote system can be developed either internally by the program that is sending the file or retrieved from disk storage. The VAX user can create IBM Job Control Language (JCL) files on-line using regular VAX utilities. A user program can add JCL to outgoing files and act on file routing information it finds in incoming files.

The emulator works in conjunction with the DUP11 full/half duplex synchronous interface, which interfaces the VAX-11/780 to a synchronous line.

A VAX system with the emulator package can drive up to four 2780 or 3780 lines at once, in any combination. Transmission speed can be as high as 9600 baud over switched, leased, or local lines.



VAX Memory Prices Cut Over 50% For Large Increments

The VAX packaged systems now come with twice the memory that they had before, with only a slight increase in the system price. The cost of add-on memory has also tumbled.

Specifically, VAX memory prices have been lowered to \$14,900 per megabyte when bought in 2 megabyte increments. A one megabyte increment now costs \$18,500.*

If you are using your VAX-11/780 for demanding applications that call for a lot of memory, you're

Custom I/O Gear Can Now Be Interfaced to VAX MASSBUS

The VAX-11/780's real-time processing capability continues to grow with the addition of the DR70-A MASSBUS interface, which allows users to easily connect custom I/O devices to a VAX-11/780 MASSBUS.

The DR70-A is a general-purpose direct memory access interface that provides block data transfers at a speed of 1.2 megabyte/sec. Available also with a single, dedicated MASSBUS in a system package called DER70-A, this memory channel interface provides high reliability by performing end-to-end parity protection on all data transfers.

A DER70-A package performs a critical function in a state-of-the-art high energy physics research application at Stanford Linear Accelerator (SLAC). This research facility chose six VAX-11/780's for its particle detector systems, with the requirement that the VAX systems perform data acquisition concurrently with on-line computation.

The VAX-11/780 with the DER70-A package meets SLAC's real-time performance needs. The DER70-A provides the necessary high-speed interface between SLAC's own buffer memory and the VAX-11/780. The DER70-A's memory readout capability is one of the keys to the application's success.

part of a trend. VAX customers are showing a tendency to put very large application programs on VAX instead of on traditional batch-oriented computers. VAX has the capacity, power, and program development tools to handle these tasks, but performs them at a far lower cost.

Now with memory prices down, VAX is an even better choice to handle huge programs or multiple users.

*Prices apply to U.S. only.

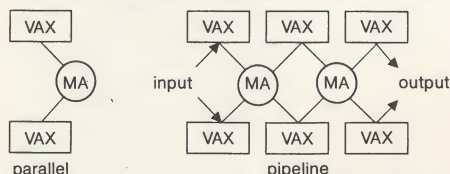
Multiport Memory Option Lets Users Develop Multi-VAX Configurations

A new multiport memory option provides a tool that allows VAX-11/780 users to develop multi-computer configurations for very high throughput or enhanced-availability applications.

Called the MA780, the multiport memory option consists of from 256 Kb to 2 megabytes of MOS semiconductor memory with error correction code. As many as four VAX-11/780s can access the one MA780 memory.

A VAX system can have up to 8 megabytes of its own memory and two MA780s can be connected with up to 2 megabytes of memory each. So a VAX-11/780 system can now directly address up to 12 megabytes of physical memory.

Depending on the application, users can arrange VAX-11/780s and MA780s in either a parallel or pipeline manner, as shown below.



In parallel systems, two or more appropriately programmed VAX systems can divide a task between them. They can pool their power and finish the job extremely quickly. A pipeline arrangement can produce high throughput by instantaneous data exchange between CPUs handling sequential parts of an application.

Each VAX-11/780 system using a MA780 has its own port, which gives the VAX system full, random access read/write ability. Each of these ports has an input and output buffer for data and commands. The MA780's controller responds to each port in the order in which it requests access. Maximum total throughput is up to 10 megabytes/sec. on transfers to memory.

The MA780 memory stores application code and data for use by one or more VAX systems, but each VAX-11/780 runs its own copy of VAX/VMS in its own local memory. Thus each VAX system remains

independent. If need be, its MA780 port can be separately switched off-line and the processor powered off for servicing, while other VAX systems continue to use the shared memory.

Any VAX system linked to a MA780 can run extensive diagnostics that test the multiport memory. There is parity and error checking on all internal MA780 buses. The MA780 generates interrupts to notify processors of power failures and error conditions as soon as it detects them.

An interlock feature prevents a shared memory location from being updated simultaneously by more than one VAX-11/780 system. Invalidation logic prevents stale data in cache memories of processors. The inherent error detection and parity checking features of the MA780, VAX-11/780, and VAX/VMS provide data integrity.

A multi-VAX system with an MA780 performs interprocessor communication by the same tech-

niques that a single VAX system uses to tie together multiple processes internally. In both cases, VAX/VMS shares data regions and uses mailboxes and common event flags.

The sharing of data regions has been achieved through extensions to the global sections capability of VAX/VMS. Global sections provide named, protected areas of memory that can be selectively shared among user programs. The extension of this facility to shared memory is totally upward compatible with the use of global sections in local memory.

An additional extension, logical name translation, has been made for global section, mailbox, and common event flag names. It allows the movement of applications to multicomputer environments with no program modification.

The MA780 can be field installed and upgraded. First shipments will begin in the first quarter of 1980.

VAX Now Offers Multiple, Medium Speed I/O Ports

A new VAX option, the DW780, now permits VAX-11/780 systems to use as many as four UNIBUSes. This gives users the ability to add more devices to their systems and to increase overall throughput by distributing high speed and low speed peripherals among different channels.

The UNIBUS is DIGITAL's standard asynchronous bidirectional bus for connecting medium capacity disks, unit record devices, terminals, communications devices, and user-designed peripherals (i.e., all devices other than high speed disk drives and magnetic tapes).

Originally designed for the PDP-11, the UNIBUS was adopted by the VAX architecture to allow both new and existing UNIBUS devices to be connected to a VAX system without modification. Now VAX systems

can incorporate up to four UNIBUSes, extending the total number of devices that can be connected to a single system and giving users added control over system throughput.

For example, a user may choose to place high performance devices such as RK07 disk drives or LPA11-K and DR11-B direct memory access interfaces, or analog-to-digital converters, on separate UNIBUSes as dictated by latency and data transfer rates. Then the user can distribute the slow, character-oriented devices such as lineprinters and terminals among those separate UNIBUSes. This arrangement lets the peripherals operate on separate data channels at levels in line with their performance. (The aggregate throughput rate of each VAX UNIBUS is 1.5 megabytes/sec.)

Increased possibilities for device support is just one more way that the VAX-11/780 appeals to users with growing processing needs.

VAX Adds Engineering Preprocessing to its Finite Element Analysis Strengths

VAX now supports a powerful engineering pre/postprocessing package as well as all major finite element analysis programs.

PDA/PATRAN-G—DIGITAL's Engineering Systems Group has signed an agreement with Prototype Development Associates of Santa Ana, California, for marketing rights to the new interactive structural pre/post processor system, PDA/PATRAN-G*.

Exclusively available on VAX, PDA/PATRAN-G is a language that engineers can use to define, in a few directives, complex three-dimensional geometries and finite element models. Directives are simple, generally non-mathematical, free format and order independent. Automated mesh refinement and automated geometry equivalencing is provided for all shapes including solids. The system supports all known finite elements.

PDA/PATRAN-G is operational on practically any graphic device but is particularly effective on color raster terminals. Additional features such as multiple split screens and instant reply, in combination with the ease of use of the system, make PDA/PATRAN-G a very effective tool.

PDA/PATRAN-G can also produce card images for input to a variety of structural analysis packages such as MSC/NASTRAN, COSMIC/NASTRAN, SAP6, SINDA, ANSYS and SAAS. The combination of VAX and PDA/PATRAN-G brings local control of powerful interactive graphics and finite element analysis to the structural analyst.

A video-taped demonstration of some of PATRAN-G's capabilities can be seen by contacting your local DIGITAL Engineering Systems Group sales representative. PDA is at 1740 Garry Ave., Santa Ana, Calif. 92705.

*PATRAN is a registered trademark of Prototype Development Associates.

SUPERB/SUPERTAB ON VAX—

Now available on VAX, SUPERB is a finite element analysis program developed and distributed by Structural Dynamics Research Corporation, of Cincinnati, Ohio, a structural consulting firm whose major market is automotive and heavy equipment manufacturing. SUPERB is currently used by 150 companies on their own mainframes, and accessed through numerous service bureaus.

SUPERB has capabilities for linear

statics, dynamics, and heat transfer analysis. It is known for its excellent library of elements, which can be used to represent complicated geometrical shapes with a minimum of input. Input for SUPERB may be generated by SUPERTAB, the interactive graphics pre/postprocessing system that also creates input for VAX/NASTRAN. SUPERTAB runs on PDP-11s as well as on VAX.

SDRC is at 2000 Eastman Drive, Milford, Ohio 45150.

TU77 Tape Drive Offers High Performance, Operator Convenience

The new TU77 adds a high performance, industry-standard tape transport to the growing list of VAX peripherals.

The TU77 reads and writes at 125 inches per second, transfers data at up to 200,000 bytes per second, and automatically threads and loads tapes. It is fully software compatible with the TU45 tape transport but is much faster.

The TU77's performance suits it to demanding applications. Tape recording is program selectable at 1600 bpi (PE) or 800 bpi (NRZI). The TU77's use of ANSI standard formats allows easy transfer of tapes between it and disk drives used on other computer systems. VAX/VMS already includes standard support for industry-compatible (ANS) tape labels and formats.

The TU77 automatically loads and threads 10.5" (26.7 cm) open reels of tape, as well as Easy Load #1 and Easy Load #2 cartridges.* Smaller reels of tape can be threaded automatically when tape is placed manually in the loading slot.

The new drive has automatic PE and NRZI error correction. Parity, longitudinal, and cyclic redundancy



checking further ensure the accurate transfer of data. VAX/VMS provides full diagnostic support. Deliveries of the TU77 have already begun in North America. Worldwide deliveries will begin in November.

*Easy Load #1 and Easy Load #2 are trademarks of IBM Corporation.

VAX's Symbolic Debugger: Why It's So Good



A VAX system tool called DEBUG is one reason VAX programmers develop and maintain applications as quickly and easily as they do.

DEBUG is an interactive symbolic debugger that simplifies program reliability checking and provides fast, convenient program and logic error tracking. It allows developers to monitor the flow of program execution interactively from a terminal keyboard. It effectively eliminates "hit or miss" debugging techniques by giving programmers complete on-line control of an application run.

Used with native mode languages, DEBUG utilizes a single set of interactive command verbs. These let users EXAMINE the contents of specific locations, DEPOSIT new contents in locations, SET breakpoints and watchpoints strategically throughout the program to study intermediate execution results, STEP through the program by single line or instruction, and STOP and resume (GO) program execution at will, to name several of its versatile interactive operations. With these DEBUG commands and others, a programmer can direct execution methodically and comprehensively to get to the heart of a coding problem quickly.

During debugging, programmers refer to statement labels, variables, constants, even array positions, using the same symbolic names that appear in the source code. This means they don't have to deal with obscure numerical references to addresses and instructions, or perform complex conversions. In addition, DEBUG recognizes the expressions of the programming language in use—FORTRAN, COBOL, MACRO, and other native mode languages—and displays data as real or integer numbers in their appropriate formats. DEBUG can even double as an on-line desk calculator if the programmer wants to do some fast ad hoc figuring during a debugging session.

One DEBUG command that is extremely helpful is the CALL command. With it, programmers can call another program or routine at any time during a debugging session. A typical use, for example, is first to create test routines and then CALL them as needed during debugging to check specific program characteristics. Following return from any called routine, program conditions are restored to what they were just prior to the call.

Another of DEBUG's particularly useful features is its ability to regain control following an aberrant execution run. For example, should a program get caught up executing an endless loop of instructions, the programmer need type only a single command to suspend execution; a second command gives control immediately back to DEBUG; and a third (illus-

trated below) prompts the debugger to follow the program execution history from the suspended point back through all the calling routines. In this way, the programmer can easily retrace all steps leading up to the trouble spot—an otherwise very complex debugging procedure.

More than likely, program debugging will continue to represent a major part of the application development cycle. But with VAX's symbolic debugger, programmers greatly reduce their debugging efforts—and associated frustrations—to produce smooth running applications in minimal time.



DBG>SHOW CALLS

module name	routine name	line	relative PC	absolute PC
	CVT_P_ANY		0000004F	00001414
	TESTA	22	0000007C	00004748

DBG>STEP

start at CVT_P_ANY + 79
stepped to TESTA/TESTA %line 28.

The SHOW CALLS command lists information about the current level of nested calls, two as shown here; STEP continues program execution one line (or instruction) at a time. This sample output shows the programmer that execution is currently suspended at line 28 in a program routine named TESTA.

VAX in a Local Distributed Processing Network... This Customer is Already Doing It

One of the largest VAX customers has 10 systems, eight of which pool their power in a local distributed processing network.

The eight VAX systems are interconnected through a combination of options called the Parallel Communications Link (PCL11) and the DMC Network Link.

The PCL is a high performance, time division multiplexer (TDM) 16-bit parallel bus that connects multiple VAX or PDP-11 processors in a local network. Mixed networks with a total of up to 16 processors are also supported. Each processor in the network can communicate with

any other in direct memory access block mode. The PCL's maximum bus bandwidth is 8 million bits per second.

The DMC Network Link is DIGITAL's synchronous serial UNIBUS interface for local and remote networks. This link uses DIGITAL's standard DECnet communications protocol, supports direct memory access transfers, and full- and half-duplex operation. DMCs can be configured for local operation at speeds up to 1 million bits per second, and remote operation at speeds up to 19,200 bits per second.

The VAX systems use the PCL links to share the customer's heavy computational load and to solve complex simulation algorithms in real-time. The DMCs link together three VAX systems that do program development. If one of these systems is fully loaded, the network automatically re-routes development work to another VAX, with no noticeable effect on response time.

The company's other two VAX systems work outside the network. Both handle independent program development and research.

Italian Engineering Firm Does Structural Analyses With Its VAX-11/780

Dr. Roberto Riccioni, vice director of ISMES, the Experimental Institute for Models and Structures, of Bergamo, Italy, stands in front of a model of the upper structure of Milan Cathedral. ISMES built the model to test the structure's behavior under various stress conditions.

ISMES is a research center with longstanding international expertise in structural analysis of civil and industrial buildings, dams, roadways, thermal and nuclear power stations, and off-shore structures. It also performs on-site geophysical measurements to determine the properties and stability of foundation rocks and soil.

ISMES uses a VAX-11/780 to carry out the many and varied analyses necessary for its projects. Before the VAX-11/780, it had been using large IBM mainframes through a service bureau. Riccioni gives his reasons for switching to a VAX in-house: "We wanted to be independent of the service bureau—to have more control in scheduling our workload and to lower our communications costs. In terms of purchase price and operating cost, VAX is extremely cost effective."



About VAX's price/performance results, Riccioni says, "VAX has increased productivity dramatically

—and our savings have been tremendous."

VAX Shines for Electric Power Company

A VAX-11/780 far outdistanced its competition in both performance and price to become the newest member of the Bonneville Power Administration's computing team.

In addition to VAX, BPA looked at PRIME and Harris systems.

"PRIME was favored initially," said Frank Orem of BPA's Chief Engineers Office, "but we chose VAX for its performance and software features."

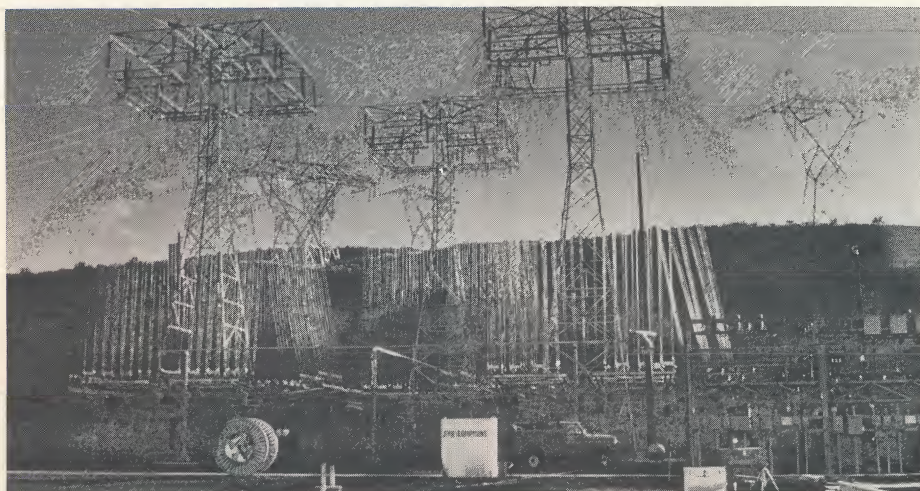
BPA is the Portland, Oregon-based operating agency of the U.S. Department of Energy's Federal Columbia River Power System. Its EMTP (ElectroMagnetic Transients Program) was benchmarked extensively on VAX. This program is distributed worldwide and is run on many different kinds of computer systems.

According to a recent memorandum sent to EMTP users, "the VAX EMTP solution speed is nearly double that of BPA's main computers (CDC-6500 and CYBER-71). This is in spite of double-precision computation."

"We were pleasantly surprised with VAX's performance on the benchmark," Orem said. "We expected a dead heat (with the CDC-6500), and were very happy to see we were going much faster." The VAX, with the optional floating point accelerator, consistently ran to problem solution in about half the time required by the CDC-6500.

In addition to performance, price, reliability, and ease of conversion, Orem said the BPA system selection committee judged the quality of VAX's text editor to be the best of any competitor. "VAX software is convenient to use. The command language, the editor and the file handling is the least verbose and easiest for users to work with" he said.

Of considerable importance in selecting VAX was its ability to share data among running programs. The data may be passed through labeled COMMON areas in the Transients program or through shared files. This inter-program communication allows programs to work together, a capability that enables an inter-



active monitoring program to control operation of the batch-mode EMTP. This can be done without altering EMTP structures. Thus, addition of advanced input/output procedures will not severely complicate program management.

BPA installed a 512 Kb VAX-11/780 in late February, 1979, and immediately began converting EMTP from their CDC system.

According to Orem, "VAX has a solid, complete FORTRAN with no size limitation, and that made the conversion very easy. EMTP is a clean FORTRAN program comprising about 60,000 lines, and is very large by most standards. But the conversion to VAX was simple—the I/O is simple and the set up for disk files is minimal. With VAX's virtual memory, you don't have to worry about size."

BPA's EMTP runs a simulation that analyzes the electro-magnetic

response of transmission lines. Users, through a second program running simultaneously, will be able to monitor the progress of the simulation by output graphics. They will stop the simulation and change the parameters, continue the simulation, and make adjustments. Orem said, "It gives the user a hands-on feel for the simulation—just as if he had dials to twist and strip charts to watch. A VAX system running EMTP, he added, "is the functional equivalent of a million dollar transient analyser using analog circuitry."

Reliability is yet another feature of VAX. Did BPA find VAX reliable? "Most certainly," said Orem, "since March, 1979, the CPU downtime has been 1 hour and 45 minutes and this was due to a hardware failure. We ran it for several weeks at 80 hours or more of CPU time with a peak of 120 hours."

VAX 'Making a Tremendous Change' At the University of Portland

"I can't believe how fast these people are programming," says Michael Arts, director of the University of Portland's computer center. He feels a VAX-11/780 has brought the computer center "a tremendous increase in programmer productivity."

"It's the ability to make changes in your programs, see them right there in front of you and then submit them to a compiler," says Brian Massey, the university's system and programming manager. "Overall, I find it extremely friendly and easy to use."

As a case in point, the University of Portland acquired its VAX-11/780 system on November 14. Arts, Massey, and three DIGITAL programmers began coding an on-line registration and admissions system in COBOL during the later half of January. They finished the project in early April. Arts and Massey won the University's Miltner award for outstanding performance in computer technology and applications.

The University of Portland is a private liberal arts college with schools of engineering, business, nursing, and education. There are approximately 2500 full time students and 2000 to 2500 more enrolled in evening, summer, and extension classes.

The computer center had a batch-oriented Honeywell 2040A for the past several years. Arts says the university would have liked an interactive computer years ago, "but it wasn't economically feasible. We're a smaller school and we had to do all our processing on one computer system."

But this time the computer center staff decided that the university should get an interactive computer that could run on-line administrative systems, instructional programming, and faculty research, simultaneously with batch processing.

"We had done a complete systems study that showed that an interactive system could really help our administrative departments," Arts says.

The on-line registration and admissions system is the first in a series of on-line administrative systems that the university plans. Others will include accounts receivable, financial and budgeting, alumni and development, security, and inventory applications.

The same computer system handling those applications, of course, would double as the university's instructional system.

"We wanted to introduce the students to interactive computing," says Dr. Thomas J. Nelson, dean of the engineering school. "We also wanted to provide examples of the latest languages, a text editor, state of the art things," Arts says.

For the faculty, Arts wanted capacity for large programs. "New professors would come in from M.I.T. or CalTech and want to bring huge computer programs along. They'd ask us to convert the programs so they could use them on our system, but it was very rarely done. I became tired of turning those guys away."

The University evaluated several computers but settled on VAX. "VAX's forte was more power for more users down the road," Arts says. "I can easily see 40 users on the system in September," he says. The system currently has 40 ports and a 600 line per minute printer. Plans call for 24 more ports to be added soon.

The system now has 768 Kb of physical memory and three 67 megabyte disk drives, which leaves plenty of room for growth:

"We wanted to come in at the low end of an architecture and expand," Nelson says. "We wanted a system large enough and expandable enough to take care of our needs for the next five to eight years. VAX is expandable to such a large system by adding memory and disks."

The university rejected another vendor's computer system that "would probably get the job done, but we felt it was already at the top end of its expandability," Nelson says.

"We also felt VAX had the ability to handle a large number of terminals, not just in terms of numbers, but in terms of providing acceptable response times," he adds.

The university's search team and its consultants also felt that the DIGITAL software support organization could provide the needed consulting and programming support to ensure a smooth installation and to help write the administrative software.

"The 85,000 PDP-11s out there," many of which are in universities, were also important to Arts. "We've already obtained a lot of software for VAX from DECUS" (the Digital Equipment Users Society).

Since the VAX system came last fall, it has been making "a tremendous change on this campus," Arts says. "All our school offices—almost everyone—wants to get on-line as soon as possible because they've seen what's happened already."

Dr. Nelson says, "timesharing makes a system that much more accessible. Even your wildest estimates don't match the actual interest in using it."

Most students take BASIC; engineering, math and science majors take FORTRAN; beyond that there are many advanced and engineering courses that make use of the system, Arts says.

"The faculty gets interested in the computer to a much greater extent and assigns more computing problems to the students. Students do these added assignments and then learn more about the system on their own," Nelson adds.

In the engineering school, "It gives us a much stronger base for a computer engineering program. In practically every course, we use the computer more."

As Massey sees it, the VAX system "does exactly what we wanted it to do. It's fulfilled our expectations and gone beyond them."

Adds Nelson, "Overall, we are impressed by its reliability and by its doing what it's supposed to do, and doing it very well."

An OEM Chooses VAX to Run a Huge Fortran Program

What do you choose when you need an affordable computer to run a huge FORTRAN program? If your needs are anything like those of Teradyne, Inc., you turn to the VAX-11/780.

The Boston, Massachusetts-based OEM has been very pleased with VAX's ability to run its complex LASAR software, which typically serves multiple users. Teradyne's engineers have been delighted with the ease and speed of getting the program up and running on VAX. They look forward to developing further applications for the VAX-based systems Teradyne sells.

Teradyne manufactures automatic test equipment for printed circuit boards. As an industry leader, the company must stay one jump ahead of the board manufacturers who use its equipment. As printed circuit boards technology changes, Teradyne's test systems must be-

come increasingly sophisticated. And that's where the VAX-11/780 helps.

Teradyne's minicomputer-based L135 LSI Board Test System is a powerful group of tools that allows electronics manufacturers to test and isolate faults on production boards quickly and economically. It helps cut costs by allowing less skilled labor to debug and repair boards at an early stage in manufacturing.

But before the L135 can do its job, test engineers must provide the system with the test patterns to be used in testing the board, and with a data base of expected responses at every node of the board to be used in diagnosing faults. A new board cannot go into production with reasonable hope of obtaining good yields until its testing procedures are defined, and until the board manufacturer's

engineers know that their procedures will catch virtually all of the possible faults on the board.

Unfortunately, perfecting the test patterns and programs can be an expensive and time-consuming process, often taking several weeks or months for a complex LSI board. If this phase of development could be shortened, Teradyne officials reasoned, electronics manufacturers would receive a two-fold reward: new products could get to market faster, providing an often-critical competitive edge, and engineers' time could be used more productively.

To meet the need for fast test program development, Teradyne decided to market LASAR, a complex software package that not only speeds the development of test routines, but also generates

(Continued on next page)



An OEM Chooses VAX

(continued)

the test patterns. LASAR also shows engineers which potential faults in a board could go undiscovered and what fraction of total possible faults they represent. The engineers can then modify the test program to catch those faults.

By using LASAR, Teradyne's customers get the benefits of more efficient test program development and shorter time to market. They also get a more thorough test program, which results in higher production yields of fault-free boards.

Because of its size (50,000 lines of FORTRAN plus 1,000 lines of optimized assembly language) and enormous appetite for memory, LASAR had originally been offered over timesharing lines to a large mainframe. Teradyne wanted to implement the program on an affordable computer so that its customers could buy a dedicated system and enjoy faster response time and better cost control.

The search for such a computer quickly led Teradyne to the VAX-11/780, and as engineering manager Harold Levin states, "VAX has met our expectations with flying colors."

Its optimizing FORTRAN compiler, high-speed execution and interactive nature allows VAX to complete long LASAR runs even faster than the timesharing mainframe. With its 32-bit architecture, VAX can easily handle the huge data arrays that LASAR involves. Teradyne has especially liked VAX's efficient virtual memory, which allows jobs requiring 5 to 15 megabytes of memory to run on a computer with less than 2 megabytes of physical memory. In addition, its large task size means that VAX can generate test programs for the densest logic on today's drawing boards.

The timesharing facilities of the VMS operating system are another critical benefit. By providing fast response times to multiple users, VAX/VMS-LASAR allows engineers to test-program many boards at once, drastically shortening the development time for complex products.

For Teradyne, VAX's exciting performance is only part of the story. Levin is equally enthusiastic about the ease of getting LASAR up and running on VAX. Echoing the comment of another VAX user, he says the machine "truly is an 'implementor's dream'. The operating system is very clean and well-structured, helping you instead of fighting you. With its efficient debugging tools, you need only a few minutes with the editor, compiler and linker to correct your code and make it run."

Converting the major part of LASAR from the mainframe to VAX took only three months. Shortly thereafter, the system was fully operational, supporting useful LASAR work as well as other development. "There was a heavy load on the operating system, but all users got good performance," Levin says.

"During that period of intensive use, we also found that VAX hardware is very reliable for a machine of its complexity. When we need repairs, Digital's service is very good," he added.

Several Teradyne engineers also commented that VAX/VMS is straightforward to learn and very well documented. In the first eight months, their many VAX users have trained themselves from the VAX/VMS manuals, even though many of them were unfamiliar with Digital equipment or with computers of VAX's complexity. "We don't recommend that users skip Digital's training courses," says Product Manager Fred Grant, "but our experience is quite a comment on your documentation."

With the first of the many VAX/LASAR systems ready to ship to a customer, what are Teradyne's future plans for VAX?

Grant expects LASAR to interface with programs for printed circuit board layout and other computer-aided design applications, and expects his customers' engineers to develop additional programs to use VAX's spare capacity. While this first application is primarily in electronics development, "We expect VAX to become more and more common in manufacturing," he says. "VAX will be a real winner."

Chemistry Program Exchange Has Software for VAX Users

If you're a VAX user doing computational chemistry research, the Quantum Chemistry Program Exchange (QCPE) at Indiana University may have a lot to offer you.

QCPE was organized in 1962 for the exchange of software among chemical researchers in industry, universities, and government. Today over 1,000 chemical researchers around the world are QCPE members. They can obtain copies of most programs in the QCPE library for about \$50.

That library currently contains over 400 programs (primarily in FORTRAN) that encompass the entire field of calculational chemistry. In the past, nearly all of these programs have required large mainframes (IBM, Control Data Corporation systems, or DECsystem-10s). Today QCPE members are beginning to convert many of the programs to VAX.

"What seems to be happening is that the economics of VAX are getting to where it's now reasonable for a university department to own its own computer," project supervisor Richard Counts says.

"There are problems in using a central computing facility. It's often more feasible to own your own VAX. But when you do that, the VAX has to do the work you were sending to the central facility," he adds. "My guess is that by and large VAX systems will do what people want them to do."

"More and more of the people we deal with are installing VAXes," Counts says. "We expect that as they develop more and more software, they'll be donating it to us."

QCPE already offers a program written specifically for VAX; a diagonalization routine from the University of Illinois.

For additional information about QCPE, contact:

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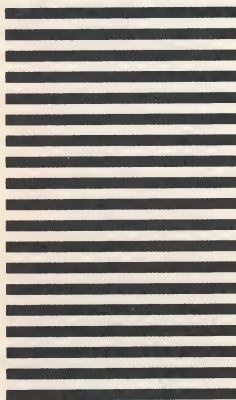
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